

TP015N065SEDP

IGBT Discrete with Anti-Parallel Diode

General Description

Topdiode TP015N065SEDP 15A, 650V IGBT Discrete provides ultra-low conduction loss as well as short circuit ruggedness. They are designed for the applications such as general inverters and UPS.

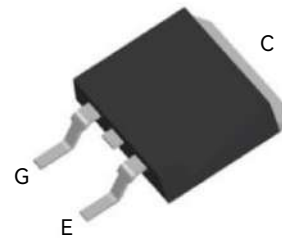
Features

- High Ruggedness Performance
- 10 μ s Short Circuit Capability.
- Positive $V_{CE(sat)}$ Temperature Coefficient
- High Efficiency for Motor Control.
- Excellent Current Sharing in Parallel Operation.
- RoHS Compliant.

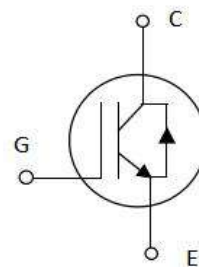
Applications

- Home Appliances
- Motor Drives
- General Inverter

TO-263-3L



Equivalent Schematic



Maximum Ratings ($T_C = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Value	Unit
V_{CES}	Maximum Collector-Emitter Voltage, $T_{vj}=25^\circ\text{C}$	650	V
V_{GES}	Maximum Gate-Emitter Voltage	± 20	V
I_C	Continuous DC Collector Current, $T_C=25^\circ\text{C}$	30	A
	Continuous DC Collector Current, $T_C=100^\circ\text{C}$	15	A
$I_{C\ pulse}$	Pulsed Collector Current, $T_{vj}=25^\circ\text{C}$	60	A
P_{tot}	Total Power Dissipation, $T_C=25^\circ\text{C}$	150	W
	Total Power Dissipation, $T_C=100^\circ\text{C}$	75	
I_F	Continuous DC Forward Current, $T_C=100^\circ\text{C}$	15	A
I_{FM}	Non-Repetitive Peak Forward Surge Current	60	A
T_{SC}	Short Circuit Withstand Time	10	μs
T_J	Operating Junction temperature Range	-40 to +175	$^\circ\text{C}$
T_{stg}	Storage Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Description	Max.	Unit
R_{thJC}	IGBT Thermal Resistance, Junction - Case	1.0	K/W
R_{thJC}	Diode Thermal Resistance, Junction - Case	1.5	K/W
R_{thJA}	Thermal Resistance, Junction - Ambient	40	K/W

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
IGBT Characteristics						
V_{CEsat}	Collector-Emitter Saturation Voltage	$V_{GE}=15V, I_C=15A, T_C=25^\circ\text{C}$		1.6		V
		$V_{GE}=15V, I_C=15A, T_C=150^\circ\text{C}$		1.9		
$V_{GE(th)}$	Gate Threshold Voltage	$V_{GE}=V_{CE}, I_C=1mA$	5.4	5.6	5.9	V
$V_{(BR)CES}$	Repetitive Peak Reverse Voltage	$V_{GE}=0V, I_{CE}=250\mu A$	650			V
I_{CES}	Collector-Emitter cut-off Current	$V_{CE}=650V, V_{GE}=0V$			50	μA
I_{GES}	Gate-Emitter Leakage Current	$V_{CE}=0V, V_{GE}=\pm 20V$			± 100	nA
C_{ies}	Input Capacitance	$F=1MHz, V_{CE}=30V, V_{GE}=0V$		1055		pF
C_{oes}	Output Capacitance			57		
C_{res}	Reverse Transfer Capacitance			15		
T_{don}	Turn-on Delay Time	$I_C=15A$ $V_{CE}=400V$ $V_{GE}=0/15V$		17		ns
T_r	Rise Time			14		
T_{doff}	Turn-off Delay Time			104		
T_f	Fall Time			46		
E_{on}	Turn-on Energy Loss Per Pulse	$R_g=10\Omega$ $T_{vj}=25^\circ\text{C}$ Inductive load		0.3		mJ
E_{off}	Turn-off Energy Loss Per Pulse			0.27		
E_{ts}	Total Loss of Switch			0.57		
T_{don}	Turn-on Delay Time	$I_C=15A$ $V_{CE}=400V$ $V_{GE}=0/15V$		16		ns
T_r	Rise Time			15		
T_{doff}	Turn-off Delay Time			119		
T_f	Fall Time			81		
E_{on}	Turn-on Energy Loss Per Pulse	$R_g=10\Omega$ $T_{vj}=150^\circ\text{C}$ Inductive load		0.38		mJ
E_{off}	Turn-off Energy Loss Per Pulse			0.40		
E_{ts}	Total Loss of Switch			0.78		

Electrical Characteristics (T_j= 25°C unless otherwise specified)

Symbol	Description	Conditions	Min	Typ	Max	Unit
Q _G	Total Gate Charge	V _{CE} =520V V _{GE} =15V I _C =15A		55		nC
Diode Characteristics						
V _F	Forward Voltage	I _F =15A, T _{vj} =25°C		1.4		V
		I _F =15A, T _{vj} =175°C		1.2		
I _{rrm}	Peak Reverse Recovered Current	V _R =400V		9.5		A
Q _{rr}	Peak Reverse Recovered Charge	I _F =15A dI _F /dt=-600A/μs		220		nC
t _{rr}	Reverse Recovery Time	T _C =25°C		55		ns
I _{rrm}	Peak Reverse Recovered Current	V _R =400V		15		A
Q _{rr}	Peak Reverse Recovered Charge	I _F =15A dI _F /dt=-600A/μs		450		nC
t _{rr}	Reverse Recovery Time	T _C =150°C		75		ns

Typical Performance

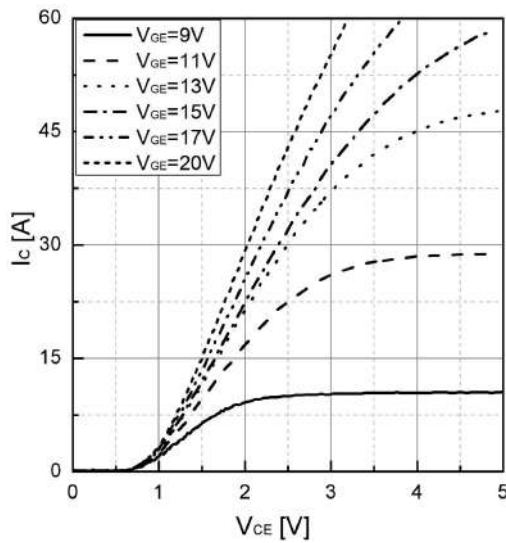


Figure1: Typical Output Characteristics
($T_{vj}=25^{\circ}\text{C}$)

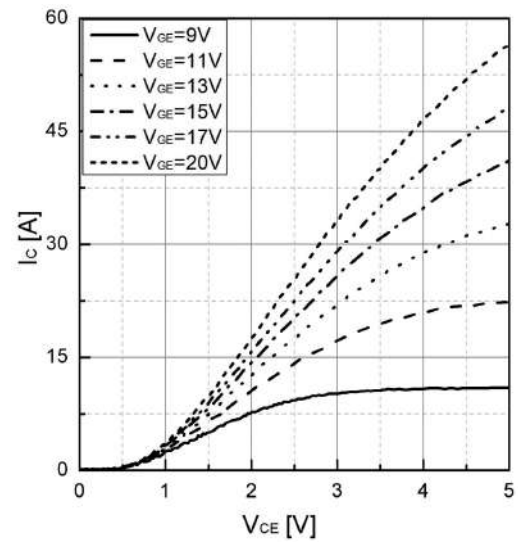


Figure 2: Typical Output Characteristics
($T_{vj}=175^{\circ}\text{C}$)

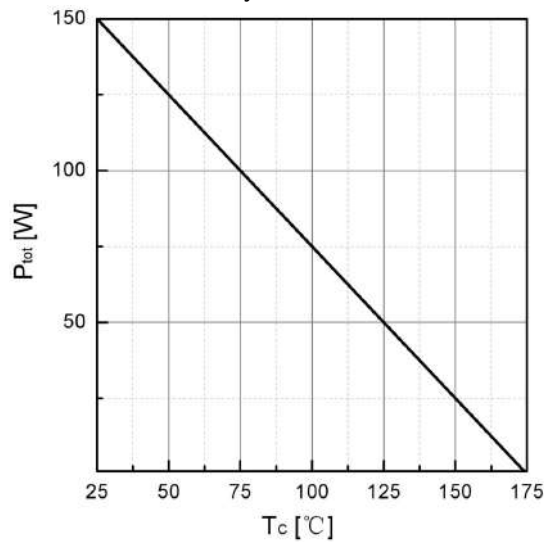


Figure 3: Power Dissipation as a Function of T_c

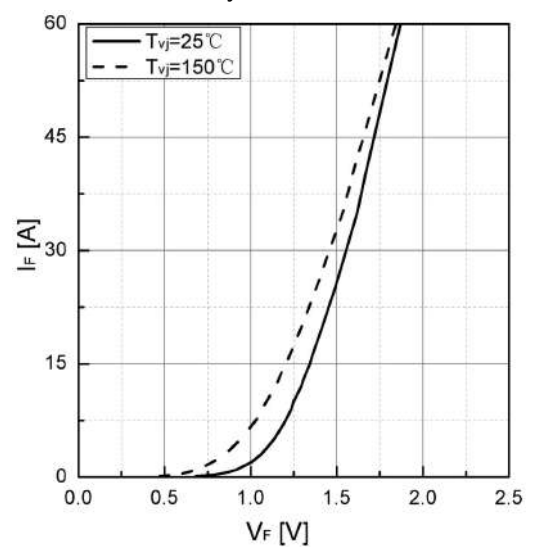


Figure 4: Typical I_F as a Function of V_F

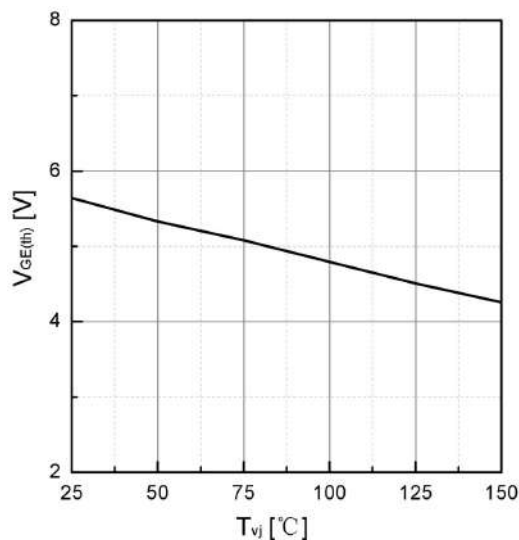


Figure 5: Typical $V_{GE(th)}$ as a Function of T_{vj}
($I_c=1\text{mA}$)

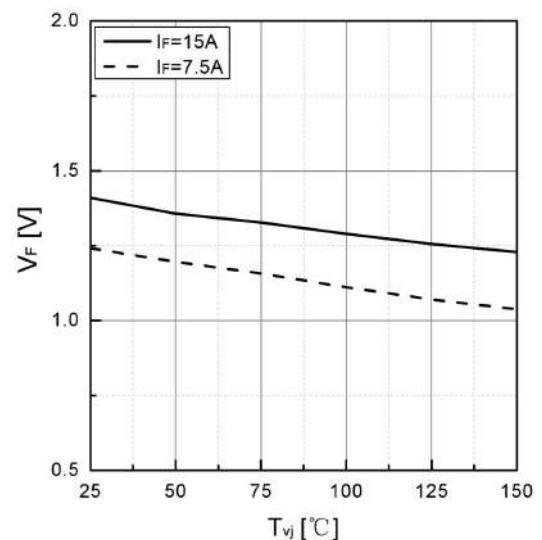


Figure 6: Typical V_F as a Function of T_{vj}

Typical Performance

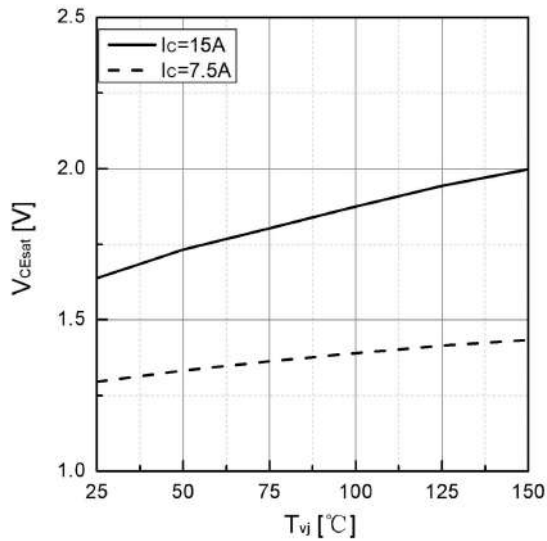


Figure 7: Typical $V_{CE(sat)}$ as a Function of T_{vj}

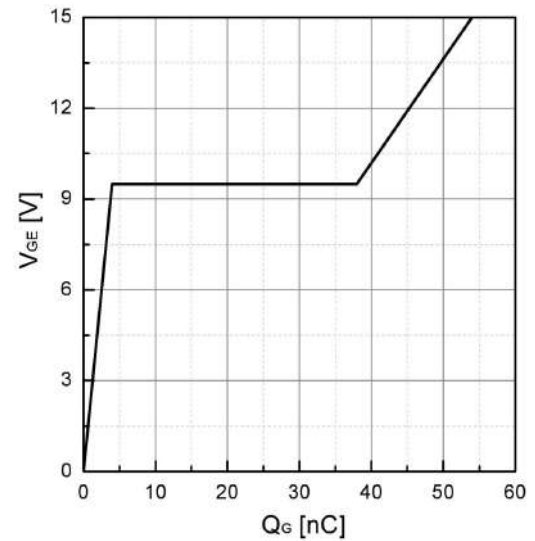


Figure 8: Typical Gate Charge

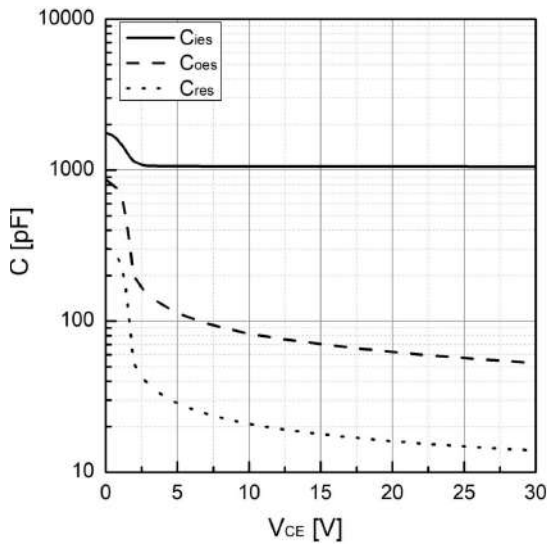


Figure 9: Typical Capacitance as a Function of $V_{CE}(f=1\text{MHz}, V_{GE}=0\text{V})$

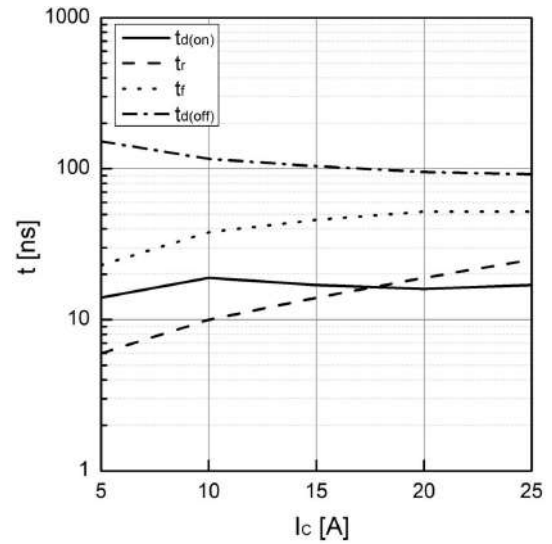


Figure 10: Typical Switching Time as a Function of I_C

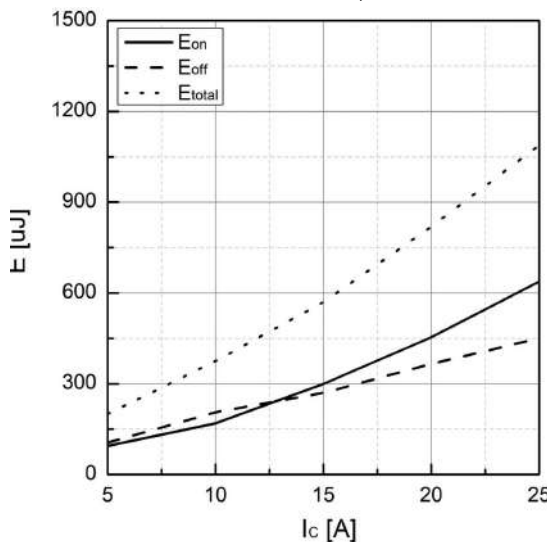


Figure 11: Typical Switching Energy Losses as a Function of I_C

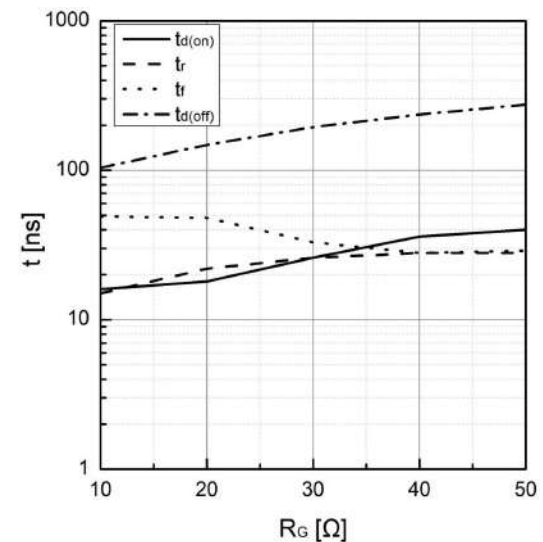


Figure 12: Typical Switching Times as a Function of R_G

Typical Performance

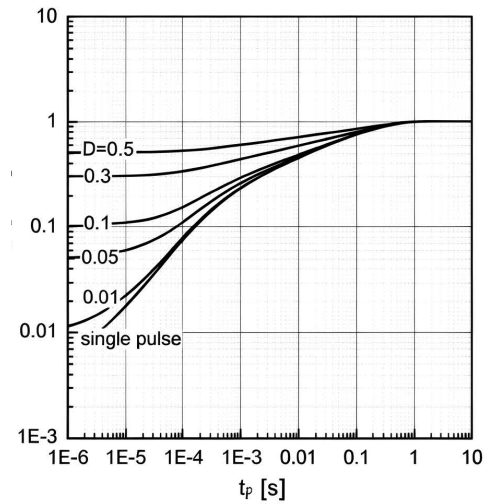
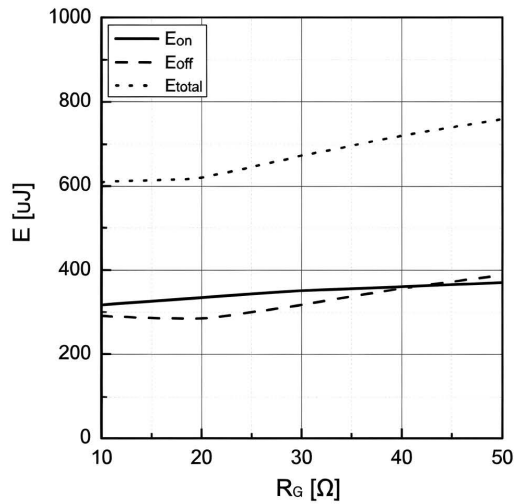
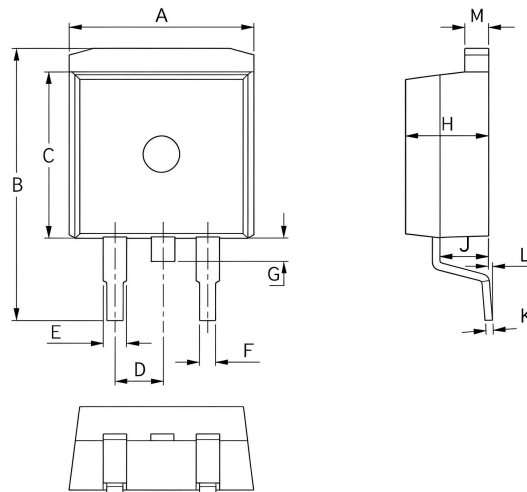


Figure 13: Typical Switching Energy Losses as a Function of R_G

Figure 14: Transient thermal impedance, IGBT

Package Dimensions

TO-263-3L



DIM	MILLIMETERS		
	MIN	NOM	MAX
A	9.90	10.05	10.20
B	14.70	15.25	15.80
C	9.4	9.50	9.6
D	-	2.54	-
E	1.20	1.30	1.40
F	0.75	0.80	0.85
G	-	-	1.75
H	4.40	4.55	4.70
J	2.30	2.50	2.70
K	0.38	0.46	0.55
L	-	0.10	0.25
M	1.25	1.30	1.35

UNIT:mm